Discovery and New Frontiers News

A Quarterly Newsletter of NASA's Discovery and New Frontiers Programs

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Welcome to New Program Manager Dennon Clardy

Paul Gilbert, who has been the Discovery, New Frontiers, and Lunar Quest Program Manager since February 2006, has been appointed manager of the Science Programs and Projects Office (SPPO) in the Science and Mission Systems Office at the Marshall Space Flight Center (MSFC) in Huntsville, AL. As SPPO manager, Paul will lead the implementation of all MSFC programs and projects funded by NASA's Science Mission Directorate (SMD).

Dennon Clardy, who has been with the program office since it moved to MSFC in 2004, initially served as mission manager for the Stardust and Dawn missions and later for Juno as well. He became the deputy program manager under Paul Gilbert in 2006, but moved to NASA Headquarters in November 2007 for a nine-month stint as a detailee to join the SMD Planetary Science Division as Associate Director. Upon his return to MSFC, he rejoined the program office. He will now take over the management of the three program offices that oversee a large number of NASA's small and medium class planetary science explorations.

Dennon's career highlights include systems engineer for the Tethered Satellite System 1 mission and then deployer chief engineer for the Tethered Satellite System re-flight mission, chief engineer for the United States Materials Processes (USMP-4) Spacelab mission, project manager for the Vapor Compression Distillation flight experiment, deputy project manager in the Space Launch Initiative Program, and deputy project manager in the Orbital Space Plane Program. Dennon began his career with NASA in 1989, previously working for McDonnell Douglas and Titan Systems, both in Huntsville. He received his BSEE from the University of Alabama.

Dennon and his lovely wife Rita will be celebrating their 25th wedding anniversary in May. They have three sons, two in college and one in high school.

http://discoverynewfrontiers.nasa.gov/

Chandrayaan-1 Launches with Two NASA Instruments Aboard

Chandrayaan-1, the Indian Space Research Organization's (ISRO) first mission to the moon, launched on Oct. 22, 2008, at 6:22 a.m. local time on a Polar Satellite Launch Vehicle (PSLV) C11 from the Satish Dhawan Space Center in Sriharikota on the southeast coast of India.

A large crowd witnesses the launch of India's moon mission.

"What we have achieved today is a remarkable journey to unravel the mysteries of the moon," said ISRO chairman Dr. G Madhavan Nair. "It's the culmination of four and a half years of work by more than 1,000 scientists." NASA Administrator Dr. Mike Griffin sent his congratulations for the successful launch of the spacecraft that is carrying two NASA instruments. In an email Griffin wrote, "India's first lunar mission will provide important insights into the lunar

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environment including data that will help support NASA's ongoing efforts to return humans to the moon. This exciting cooperative mission is a major step in our mutually beneficial relationship in civil space exploration."

Chandrayaan-1 is India's first spacecraft mission beyond Earth's orbit. India joins the United States, former Soviet Union, the European Space Agency, China and Japan with the world's 68th moon mission. Chandrayaan means "Moon Craft" in ancient Sanskrit.

Chandrayaan-1 weighs about 3,000 pounds and is shaped like a cuboid with a solar panel projecting from one of its sides. Its primary objectives are to expand scientific knowledge of the moon, upgrade India's technological capability, and provide challenging opportunities for planetary research. It carries 11 scientific experiments, including the Moon Mineralogy Mapper, or M^3, which was funded by NASA as a Discovery Mission of Opportunity. M^3 is a state-of-the-art imaging spectrometer that will provide the first map of the entire lunar surface at high spatial and spectral resolution, revealing its mineral composition. Scientists will use this information to answer questions about the Moon's origin and development and the evolution of terrestrial planets in the early solar system. Future astronauts will use it to locate resources, possibly including water, that can support exploration of the moon and beyond.

On Nov. 8 Chandrayaan-1 was put into a circular lunar polar orbit, and six days later the 77-pound Moon Impact Probe (MIP) was released and hit the lunar surface near the moon's south pole. The MIP carried a video camera, a radar altimeter, and a mass spectrometer, and it returned data before the crash.

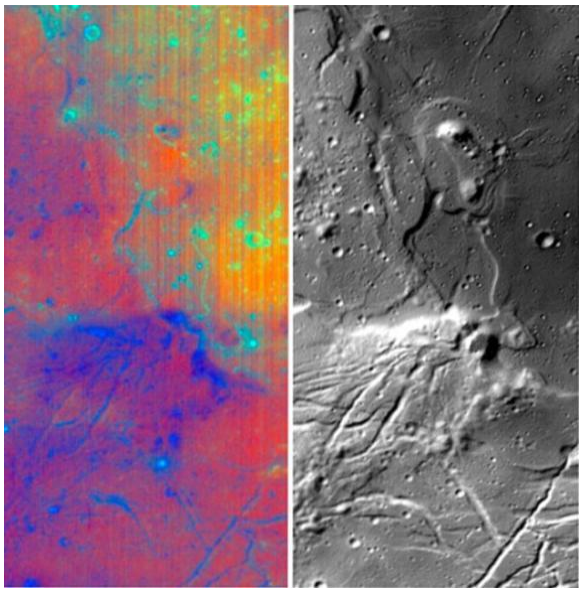
On Dec. 17, the first science results from M^3 were released. A composite image (at right) showing different wavelengths of light provides new information about the moon's Orientale Basin region. M^3 is the first instrument to provide highly uniform imaging of the lunar surface. Along with the length and width dimensions across a typical image, the instrument analyzes a third dimension – color.

"The Moon Mineralogy Mapper provides us with compositional information across the moon that we have never had access to before," said Carle Pieters, the instrument's principal investigator. "Our ability to now identify and map the composition of the surface in geologic context provides a new level of detail needed to explore and understand Earth's nearest neighbor."

Education and Public Outreach Highlights

M^3 released its new E/PO web site, which contains cool stuff for kids, engaging education materials for teachers, and a wealth of information and resources about the moon.

The science team has created a Science Blog web site featuring data and science team information to share with colleagues and the public. Visit the site for a look at the first set of new data that the M^3 instrument collected for Orientale Basin on Nov. 22, 2008.



The image on the left is a color composite of data from 28 separate wavelengths of light reflected from the moon. The blue to red tones reveal changes in rock and mineral composition, and the green color is an indication of the abundance of iron-bearing minerals such as pyroxene. The image on the right is from a single wavelength of light that contains thermal emission, providing a new level of detail on the form and structure of the region's surface.

Kepler Moves Closer to Launch

The Kepler spacecraft underwent final testing and was the subject of many reviews during the past quarter, as the countdown clock ticks toward launch, planned for March 5 from Cape Canaveral Air Station in Florida.

During October, the Flight Segment successfully completed thermal vacuum testing, open door functional testing of both the photometer and the spacecraft, and EMI/EMC testing, concluding the mission's environmental test program.

The Project conducted a Post-Environmental Test Review on Oct. 22 at Ball Aerospace to evaluate the results of the Kepler flight system–level environmental testing and the compliance with the requirements established for the test. The success criteria were met, allowing the mission to proceed to the Pre-Ship Review.

The Launch/Commissioning/Science Operations Phase Readiness and Risk Review were conducted in late November. The general board opinion was that the project is in good shape to be ready to commit to launch.

Flight Segment Comprehensive Performance Testing continued in November with no issues reported. The Flight Segment remained fully assembled and in excellent health.

Ball Aerospace workers conduct a light test on Kepler's solar array panels at the Astrotech facility.

The Kepler Ground Operations Working Group Review was conducted at the Astrotech Space Operations Facility in Titusville, FL, on Dec. 4. The review went well with no major issues of concern. A Ground Operations Readiness Review was convened by the Launch Services Program which concluded that facilities at the Kennedy Space Center and Astrotech would be ready to receive the Kepler Flight Segment.

Meanwhile the launch vehicle was undergoing stacking and testing. The Operations Readiness Test also took place in early December. The final hardware testing at Ball Aerospace concluded on Dec. 17, and the Pre-Ship Review was conducted on the same day. The review was very thorough, and the Board's general consensus was that the project conducted a successful review and completed its success criteria. In early January, the Kepler spacecraft was shipped via convoy to Astrotech to be processed before being carried to the launch pad.

The Kepler project held its Operations Readiness Review on Jan. 20-21 at the Laboratory for Atmospheric and Space Physics in Boulder, CO, and its Flight Readiness Review on Feb. 5 at KSC. Kepler passed both reviews with two issues flagged for final resolution prior to the Mission Readiness Briefing on Feb. 25. The excitement builds as each of these steps gets Kepler closer to launch atop a Delta II rocket, currently planned for March 5. Visit the NASA Kepler web site to view a video of the flight segment arriving and many photos of the spacecraft and rocket being prepared for launch.

Education and Public Outreach Highlights

The mission collected 58,763 names of people who will be sending their names into space with Kepler, part of the mission's participation in the International Year of Astronomy.

The Kepler E/PO team has conducted four pre-launch educator workshops where teachers learned about the mission and received standards based, classroom ready activities including: Human Orrery, Detecting Extrasolar Planets, Transit Tracks, and building a computer-interfaced transit model.

Two workshops took place in November, at the SETI Institute in Mountain View, CA, and at the University of Colorado's Laboratory for Atmospheric Physics in Boulder. Two more were conducted at the Kennedy Space Center Educator Resource Center and at the Jet Propulsion Laboratory in Pasadena, CA. The workshops included an overview of the science and technology behind the mission with opportunities for questions and discussion, followed by demonstrations of planet detecting activities.

Teachers make transit models at the JPL workshop.

MESSENGER Swings by Mercury Again

The MESSENGER spacecraft carried out its second flyby of Mercury on Oct. 6 at 4:40 am ET. The probe came within 1.1 miles of the target aim-point, and at its closest approach was 124 miles from the surface of the planet. The second Mercury flyby was very successful from a trajectory, command sequence, and operations perspective.

Eight sets of optical-navigation images were taken on approach to Mercury. By Oct. 9, all data from the encounter were received by the Mission Operations Center, including 64 optical navigation images and 1,223 high resolution science images.

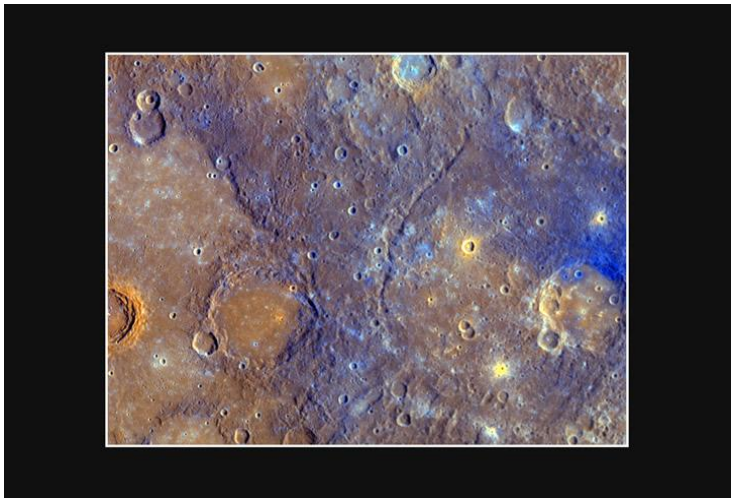
On Oct. 15, MESSENGER achieved a speed relative to the Sun of about 39 miles per second as it flew to within 28 million miles of the Sun. This was both the closest the spacecraft has come to the Sun, and the fastest it has traveled since its launch over four years ago.

When Mariner 10 flew past Mercury three times in 1974 and 1975, it imaged less than half the planet. Last January, during MESSENGER's first flyby, its cameras returned images of about 20 percent of the planet's surface missed by Mariner 10. With its second flyby of Mercury, MESSENGER's color images of the planet are unveiling another 30 percent of Mercury's surface not previously seen by spacecraft.

NASA held a Science Update on Oct. 29 with four MESSENGER science team members announcing findings and releasing new images from the flyby. It was carried live on NASA Television. Participants were Brian Anderson, Ronald Vervack, Jr., Maria Zuber, and Mark Robinson.

The entire Science Team convened in early November in Boulder, CO, for the 17th Science Team Meeting. The four Science Discipline Groups summarized preliminary results from the recent flyby as well as anticipated changes in their observations for the upcoming third flyby. Plans for further presentations and publications were also discussed, as well as ongoing preparations for orbital operations.

A Lessons Learned review was held in late November to discuss the adequacy of planning and operations for the second Mercury encounter to identify potential changes that could benefit future operations. Summaries were prepared in the areas of mission operations, spacecraft subsystems, science payload, mission design and navigation, and science operations. Some small improvements were identified for future activities, but the consensus was that the planning was well thought out with no major changes required for Mercury flyby 3 next September.



This photo was taken by the Wide Angle Camera of the Mercury Dual Imaging System just after closest approach when the sunlit side of Mercury was fully in view. It's among the highest-resolution color images ever obtained of Mercury, showing the relationship between the relatively young smooth plains on the left and older, dark blue material on the right. The blue material was ejected from the crater on the right, covering older smooth plains. A younger crater excavated through the blue material to reveal the smooth plains beneath.

MESSENGER's fourth deep-space maneuver (DSM-4), the mission's second largest to date, was conducted in two parts on Dec. 4 and 8. The two-part sequence was designed to perform 90% of the needed velocity change as part of the first maneuver and 10% as part of the second. As planned, a total velocity change of 250 m/s was achieved.

Education and Public Outreach Highlights

Congratulations to Stephanie Stockman, MESSENGER's E/PO lead, who has accepted a new position as the Science Mission Directorate E/PO lead at NASA Headquarters. Steph's MESSENGER role has been assumed by Heather Weir and Julie Edmonds.

The MESSENGER E/PO team at the Applied Physics Lab (APL) in Laurel, MD, hosted a "Fellows at the Flyby" event, where five MESSENGER Educator Fellows traveled to APL to observe the activities at the Mission Operations Center during the flyby on Oct. 6. The Fellows also observed the activities at the Science Operations Center for the first few days after the flyby as the science data arrived and analysis began.

The Fellows reported on their observations using social networking sites on the Internet, allowing teachers, students, and the general public around the world to experience the excitement of the flyby. The Fellows also answered questions posed by the students from their schools via emails, blogs and videoconferencing. The five educators were Brenda Conway (Virginia), Debra Gallagher (Ohio), Gene Gordon (New York), Sally Jean Jensen (New Hampshire) and Susie Miller (North Carolina). The event was deemed a great success by all participants, and the team hopes that it will be possible to host similar events at later mission milestones.

A MESSENGER kiosk was set up at APL for a public lecture following the M2 flyby. After the event the kiosk was moved to the Goddard Visitor Center for display. The team hopes to loan the kiosk to MESSENGER Fellows for display in their communities.

New Horizons Completes Checkout; Goes Back to Cruise & Snooze

Throughout the last quarter of the year, the New Horizons team continued to perform the second round of Annual Checkout, or ACO 2, activities which began in September. They also began to rehearse activities for the Pluto encounter in 2015.

The ACO activities included subsystem and instrument tests, such as optical navigation observations; science observations of Pluto, Uranus, and Neptune using the Ralph camera and the LOng Range Reconnaissance Imager (LORRI); solar calibrations using the Pluto Energetic Particle Spectrometer Science Instrument (PEPPSI); collection of solar wind statistics with the Solar Winds Around Pluto (SWAP) instrument; and check out of the Student Dust Counter for data collection and downlink.

The rehearsal efforts focused on developing sequences for the Pluto encounter. Preliminary Design Reviews for spacecraft subsystems during encounter are being planned to be conducted in two parts. The first review in January will examine Mission Design, Navigation, Deep Space Network, and Science Operations. Review of the other subsystems will be held in the spring.

In early December, the team began preparing the spacecraft to return to hibernation and initiated Pluto encounter planning activities. On Dec. 16, New Horizons successfully transitioned into electronic hibernation, wrapping up nearly four months of tests, data collection, and software upgrades.

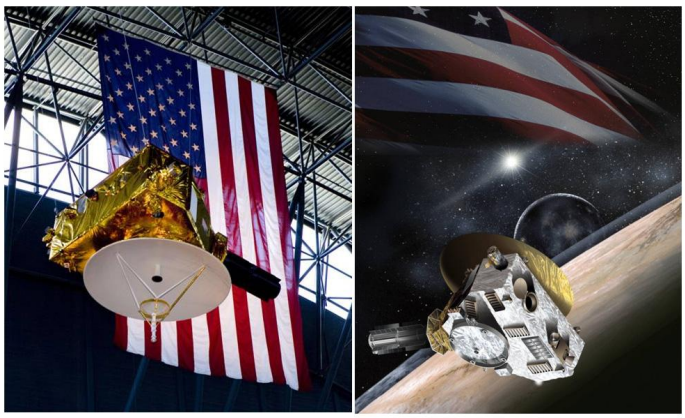
Principal investigator Alan Stern said, "I'm in awe of all the team accomplished during this checkout – multiple software uploads, full spacecraft and payload checkouts, instrument calibrations and new capability tests, star-tracker imaging, trajectory tracking refinement, science measurements, and all of it went well."

New Horizons is now about 12 AU from the Sun and 19 AU to Pluto (an astronomical unit, or AU, is the distance from the Earth to the Sun, or 93 million miles). Now three years since launch in January 2006, the spacecraft is 1.2 billion miles from Earth, speeding away from the Sun at nearly 11 miles per second – covering more than 950,000 miles a day.

New Horizons will remain in electronic slumber until July 2009, when it will be awakened for the next annual checkout, expected to last four to six weeks. Until then, the team, working with NASA's Deep Space Network of receiving stations, will listen weekly for the radio beacon tones and bimonthly for the telemetry contacts that indicate the probe's health.

Education and Public Outreach Highlights

On Oct. 17, a full-scale model of the New Horizons spacecraft was "inducted" into the Smithsonian National Air and Space Museum's Udvar-Hazy Center in a ceremony that celebrated the mission's



The New Horizons model at the Udvar-Hazy Center.

accomplishments since launch. At the event, PI Alan Stern revealed publicly for the first time the nine commemorative items sent along on New Horizons:

- a portion of Pluto discoverer Clyde Tombaugh's ashes and an inscription
- "Send Your Name to Pluto" CD-ROM with more than 434,000 names of people who wanted to participate in this great journey of exploration
- CD-ROM with project personnel pictures
- Florida state quarter, for the state New Horizons was launched from
- Maryland state quarter, for the state New Horizons was built in
- cutout piece of the historic SpaceShip One and an inscription
- U.S. Flag 1
- U.S. Flag 2
- 1991 U.S. stamp proclaiming, "Pluto: Not Yet Explored"

Dawn Prepares for Mars Assist

The Dawn spacecraft continues to be healthy and is operating normally as it prepares to swing by Mars for a gravity assist on Feb. 17. Sustained thrusting on ion thruster #1 continued through Oct. 31, then the spacecraft began coasting in anticipation of the Mars Gravity Assist. Thrusting will resume in June.

The project successfully executed a solar array calibration on Nov 4. This brought the solar array up to its peak power point and will allow the project to update the solar power model. This is significant as the solar array power directly affects the ion thrusting performance. A measured increase in performance will translate into increased robustness of the low-thrust trajectory to Vesta and Ceres, and increased time available for science collection at Vesta.

The first trajectory correction maneuver (TCM-1) was performed on Nov 20. It targeted the 500 km altitude aim point over the Northern hemisphere of Mars for the February gravity assist.

Education and Public Outreach Highlights

The Dawn E/PO team participated in STEMapalooza in Denver in October. The event was attended by over 5,000 students and their teachers. The team distributed the mission fact sheet, bookmark, children's packet, and Asters story booklet. Their exhibit also displayed the Dawn pull-up and dwarf planet activity poster and featured the ion propulsion interactive.

Dawn's John Ristvey from McREL, at right, works with students at STEMapalooza.

The Dawn team presented a workshop at the National Middle School Association national conference in Denver and handed out interactive educational materials to 33 participants. They also distributed mission materials at the exhibit booth.

A Dawn workshop was featured at the Colorado Science Conference for Professional Development in the "Evolution of Science Education" theme. The workshop was titled, "CSI: Interaction of Energy and Matter: NASA Dawn Mission."

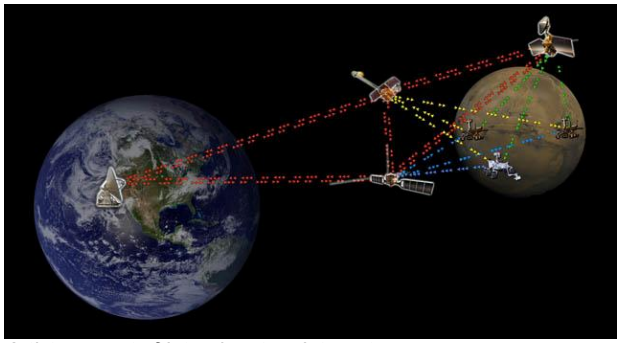
On March 7, the Dawn E/PO team is planning an educator workshop to be presented simultaneously in four locations via NASA's Digital Learning Network. Locations are the Jet Propulsion Laboratory in Pasadena, CA; Oregon Museum of Science and Industry, Portland, OR; Denver Public Schools, Denver, CO; and NASA IV and V Facility Educator Resource Center, Fairmont, WV. Follow the link above to register.

EPOXI Tests First Deep Space Internet

EPOXI, is a follow-on mission that is re-purposing the Deep Impact spacecraft. It spent January – August of 2008 in its EPOCh (**E**xtrasolar **P**lanet **O**bservation and **Ch**aracterization) mode, looking for planets around other stars and collecting over 180,000 photometric quality images. During the spring and summer, the spacecraft observed numerous stars, and the EPOCh scientists are busy analyzing the data. Preliminary results were presented at the AAS Division for Planetary Sciences meeting in October at Cornell University.

The spacecraft is now in its DIXI (**D**eep **I**mpact E**x**tended **I**nvestigation) mode, on its way to comet Hartley 2, but from mid-October to mid-November it took time out to help NASA carry out a series of experiments for the Interplanetary Internet.

The terrestrial Internet we use on Earth sends information as a series of small partial messages that travel different routes. Those routes are chosen depending on where Internet traffic and roadblocks occur (computers that are down or are very busy). The pieces are automatically reassembled at the receiving end into the complete message so that the user does not have to worry about how the pieces travel.



Artist concept of Interplanetary Internet.
Image credit: NASA/JPL

For an interplanetary network, for example from Mars via several different spacecraft (one in Martian orbit, one in a terrestrial orbit, another en route to some destination in the solar system), the time delays between routes may be measured in tens of minutes to many hours rather than in milliseconds to a few seconds as is the case for the terrestrial Internet. Working as part of a NASA-wide team, engineers from NASA's Jet Propulsion Laboratory (JPL) in Pasadena, CA, used software called Disruption-Tolerant Networking, or DTN, to transmit dozens of space images to and from Deep Impact which was located more than 20 million miles from Earth. The test was called DINET (Deep Impact DTN experiment). Computers on the ground at JPL were used to simulate stations on Earth, Mars, and the Martian moon Phobos. Images were sent among these computers with some information routed entirely on the ground and other information routed via the Deep Impact spacecraft.

The entire experiment was successful, including transmitting all the data without corruption as various faults and breakdowns in the system were simulated.

Although the Deep Impact spacecraft's role was just to provide a mechanism for the DINET team to test their software, the mission team was closely involved because they needed to load new software onto the spacecraft to make it act like a router for data. The team was pleased to support this activity that will ultimately lead to much better communications across the solar system.

On Dec. 29, Deep Impact flew past Earth, getting a gravity assist that reoriented the orbit to optimize the encounter with comet Hartley 2 in November 2010. There will be 3 more flybys of Earth before the 2010 encounter.

Education and Public Outreach Highlights

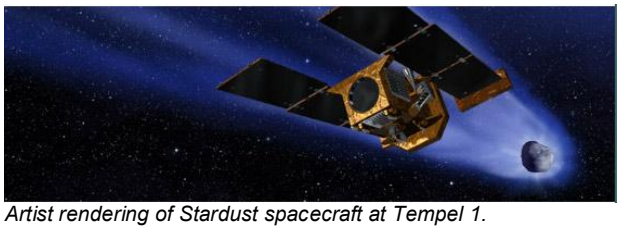
In October, EPOXI was featured at a Denver Museum of Nature and Science educator night and at the STEMapalooza event at the Colorado Convention Center which drew more than 5,000 attendees.

EPOXI and Stardust-NExT partnered to present "Comet on a Stick: NASA's EPOXI and Stardust-NExT" at the Colorado Association of Science Teachers conference in November.

Teachers: Are you interested in testing two comet related classroom activities? The EPOXI E/PO team offers two standards-driven activities designed to meet the needs of all students, including disadvantaged and underserved. To learn more and sign up for the spring field study, contact Dr. Stephanie B. Wilkerson, EPOXI E/PO Principal Evaluator, Magnolia Consulting, LLC, at stephanie@magnoliaconsulting.org.

Stardust – NExT Gets Gravity-Assist from Earth Flyby

The Stardust spacecraft, continuing on as Stardust-NExT (**N**ew **Ex**ploration of **T**empel 1), continues on its journey to revisit the comet encountered by the Deep Impact spacecraft in 2005. In October, the science team held its first meeting at Cornell University in conjunction with the AAS Division for Planetary Sciences conference. The second science team meeting to begin planning the encounter with Tempel 1 is planned for March.



Artist rendering of Stardust spacecraft at Tempel 1.

Calibration of the Navigation Camera began in early December. Both the Sun and the spacecraft's heaters have been used to warm up the camera because it produces clearer images after being heated. Analysis of recent images show that the heating of the camera worked to clear contamination. On Dec. 10, the Dust Flux Monitor, one of the science instruments, was commanded on. Tests have demonstrated that it is healthy and will be ready for the February 2011 encounter.

As Stardust approached Earth for a gravity-assist flyby on Jan. 19, the camera was calibrated by taking images of known stars, with mosaics taken of several star targets. While close to Earth, several images of the Moon were taken.

In October, Tim Larson was named project manger for both Stardust-NExT and EPOXI, replacing Tom Duxbury who retired after 42 years of service to JPL. Tom was widely recognized for his outstanding job of managing the Stardust mission, after he took over the position from Ken Atkins. Tim worked on Deep Impact as the mission assurance manager, so he very familiar with the destination for Stardust-NExT. Tim, who joined JPL in 1993, also served as mission assurance manager on the Dawn mission and most recently was deputy manger of JPL's Reliability Engineering office.

Education and Public Outreach Highlights

Stardust-NExT released its new web site, which contains a wealth of information on the science and technology of the two missions and on comets.

Juno Convenes Working Groups and Review Teams

The Juno mission continues work toward a 2011 launch that will begin a five-year journey to Jupiter, to improve our understanding of the formation, evolution and structure of the mysterious gas giant.

In October, Juno project team members along with Lockheed Martin-Denver staff and selected aerospace engineers formed a tiger team to focus on the design challenges associated with internal electro-static discharge (IESD). This is a follow-up to the IESD Workshop held at JPL in early September and will help ensure that IESD is appropriately accounted for in upcoming subsystem, instrument, flight system, and project Critical Design Reviews (CDR).

JPL and Goddard Space Flight Center have sent magnetics test equipment to Lockheed Martin-Denver to populate their newly constructed Juno Magnetics Test Lab. This facility will complement the Magnetics Test Lab located at JPL. Both facilities will be used for magnetics susceptibility as well as magnetic emissions/de-magnetization tests for Juno hardware.

The Juno Ground Operations Working Group conducted meetings at the Astrotech facility near Kennedy Space Center in mid-October. Also this past quarter the Juno Mission Systems team held technical discussions with the Plasma Waves Instrument, Jovian Auroral Distributions Experiment, the Ultraviolet Spectrograph, and the Microwave Radiometer teams to discuss the mission system operations framework for the instruments as well as operational requirements. Technical discussions will be conducted with each of the instrument teams.

The project completed management and technical meetings with Selex Galileo and Thales Alenia Space Italiana as part of the ASI (Italian Space Agency) Quarterly Review in Rome and Florence on Oct 28. Design and schedule topics were discussed with the providers of the Ka-band transponder and Jovian Infrared Auroral Mapper instrument.

Juno conducted an Incompressible Test List (ITL)/Test-Like-You-Fly (TLYF) Workshop at Lockheed Martin-Denver as part of the preparations for the upcoming Project/Flight System CDR in April. The project will prepare a "final" ITL/TLYF matrix for the CDR and will update it for subsequent milestone reviews.

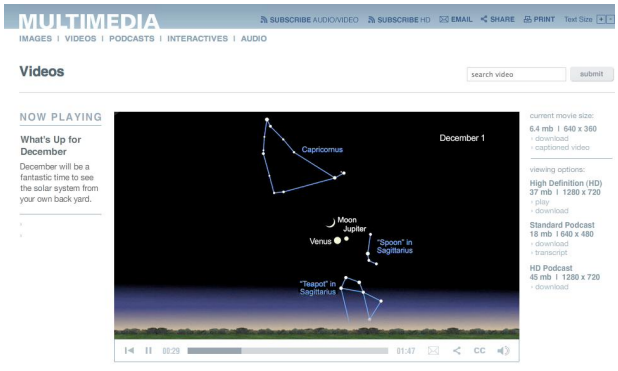
In December, the Juno team completed Magnetics and Internal Electro-Static Discharge (IESD) workshops at Lockheed-Martin-Denver. The Magnetics Workshop addressed the requirements for Juno, summarized the early magnetics characterization testing completed to date and options for other early magnetics testing, and reviewed design considerations for magnetic cleanliness. The IESD Workshop reviewed cable testing to date, the anticipated IESD design requirements, and the plan to complete the work relative to the Juno CDR schedule.

In mid-December, Juno, Mars Science Lab, and GRAIL initiated working group discussions to identify and define options to resolve launch site processing conflicts in the August-November 2011 timeframe.

Education and Public Outreach Highlights

The Nov. 24 NASA press release announcing that NASA is officially moving forward with the Juno mission, which will conduct an in-depth study of Jupiter, was featured on several media sites including: Space Daily, Science Daily, Space.com, New Scientist, Times of India, Cnet News, and Wall Street Journal's Market Watch online.

JPL's "What's Up in the Night Sky" monthly video and podcast featured Jupiter and Juno in the "What's Up for December" 2008 episode.



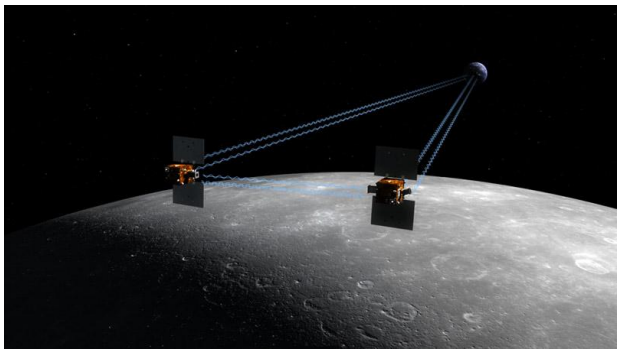
"What's Up for December" video featuring Jupiter and Juno.

E/PO partner, the Goldstone Apple Valley Radio Telescope/ Lewis Center for Educational Research (GAVRT/LCER), is producing curriculum products featuring Jupiter designed to facilitate student understanding of the scientific method. Recently GAVRT students and their teacher created a comic that will be used as an animated on-line feature.

"Giant Worlds: A Voyage to the Outer Solar System," which features Juno, is a 3,500 sq. ft. traveling exhibition about the gas giant planets developed by the Space Science Institute, Boulder, CO, with major funding from NASA and the National Science Foundation. Designed to bring new discoveries to the public and the classroom, the exhibition began its national tour in 2008 at the Orlando Science Center, then moved to Space Center Houston, and is now at the Reuben H. Fleet Science Center in San Diego through May 3.

GRAIL Confirmed to Proceed

The Gravity Recovery and Interior Laboratory, or GRAIL mission, completed a major milestone with the Project Preliminary Design Review (PDR), conducted Nov. 11-13. Cheryl Reed, Applied Physics Lab, chairs the Standing Review Board (SRB) and Kaiser Adeni, from NASA's Independent Program Assessment Office, is the Review Manager. Ten other board members represent the three robotic NASA Centers. Dr. Byron Tapley from the University of Texas Center for Space Research, the Gravity Recovery and Climate Experiment (GRACE) mission Principal Investigator, is also a board member. GRACE is the Earth satellite precursor to GRAIL.



Artist concept of the GRAIL missions twin spacecraft in orbit around the moon. Image credit: NASA/JPL

The consensus of the SRB was that it was an excellent review, and the project is well along. On Nov. 20, the SRB submitted to the project 24 Requests for Action (RFAs), 14 Requests for Information (RFIs), and 3 Observations. The project provided their disposition of the RFAs on Dec 1.

The Discovery Program Office and GRAIL Project participated in the GRAIL Standing Review Board briefing at NASA Headquarters on Jan. 14. The briefing was conducted as a "dry run" for the GRAIL Confirmation Review on Jan. 28. The SRB presented their findings and recommendations, and the Project presented their responses and planned actions. Several actions were given to help the Project adequately prepare for the upcoming reviews.

The GRAIL Project and GRAIL Standing Review Board briefed the JPL Center Management Council on Jan. 21. The GRAIL Key Decision Point, or Confirmation Review, with the Science Mission Directorate (SMD) Directorate Program Management Council (DPMC) was held at NASA Headquarters on Jan. 28, 2009.

The review included presentations by Dr. Maria Zuber (Principle Investigator), Dave Lehman (Project Manager), Cheryl Reed (SRB Chair), and Dennon Clardy (Discovery Program Manager). After an executive session led by Michael Luther (DPMC Chair), the Council deemed the KDP-C a success and approved the GRAIL Project to proceed with the execution of Phase C/D, Design and Development. Congratulations to the mission teams for all their efforts to get through CDR and transition into the next mission phase.

Education and Public Outreach Highlights

The GRAIL E/PO program is led by the first American woman in space, Sally Ride, and her team from Sally Ride Science (SRS). SRS is an innovative company founded in 2001 to support girls' and boys' interests in science, math and technology.

GRAIL will be offering a workshop at the upcoming Sally Ride Science Festival on Feb. 28 at Lamar University in Beaumont, TX, titled "Making a Moonscape." Students will learn about the surface of the moon and perform hands on activities making lunar craters and regolith.

Discovery and New Frontiers News

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